

UNITED STATES
NUCLEAR REGULATORY COMMISSION
OFFICE OF NUCLEAR REACTOR REGULATION
WASHINGTON, D.C. 20555-0001

January 25, 1995

NRC INFORMATION NOTICE 95-06: POTENTIAL BLOCKAGE OF SAFETY-RELATED STRAINERS
BY MATERIAL BROUGHT INSIDE CONTAINMENT

Addressees

All holders of operating licenses or construction permits for nuclear power reactors.

Purpose

The U.S. Nuclear Regulatory Commission (NRC) is issuing this information notice (IN) to alert addressees to the potential blockage of safety-related strainers by material brought inside containment. It is expected that recipients will review the information for applicability to their facilities and consider actions, as appropriate, to avoid similar problems. However, suggestions contained in this information notice are not NRC requirements; therefore, no specific action or written response is required.

Description of Circumstances

On April 28, 1994, with the reactor in cold shutdown, the licensee for the Palisades Nuclear Power Station (Palisades) determined that plastic material used inside containment could block the containment sump screens after a design basis accident. The licensee declared the high-pressure safety injection pumps and the containment spray system pumps inoperable and began thoroughly cleaning the containment to remove unnecessary material that could contribute to the blockage of containment sump screens.

In April 1994, at the Grand Gulf Nuclear Station (Grand Gulf), engineering personnel evaluated whether plastic wrap and similar materials used inside containment could block safety-related strainers. The evaluation specifically addressed the potential for a thin plastic film used to cover the personnel shielding platform and the dryer/separator strongback to become dislodged by containment spray during a loss-of-coolant accident (LOCA) and enter the suppression pool and eventually block the emergency core cooling suction strainers. The plastic film had been used to cover the equipment to prevent the spread of loose surface contamination.

On October 10, 1994, at Browns Ferry Unit 2, divers inspecting the underwater surfaces of the Unit 2 torus found numerous pieces of cloth-like material on the bottom of the torus and on the surfaces of the emergency core cooling strainers. The pieces were typically 25 square centimeters [4 square inches] in size, but smaller pieces were also found. The divers made a videotape of the as-found condition of one half of the torus. This included two of the four emergency core cooling suction strainers inside the torus. The videotape

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showed that about 15 percent of the surface area of one strainer was covered and a lesser amount of the second strainer. The material was later found to be pieces of absorbent paper towels sometimes used inside containment for maintenance and cleaning purposes.

Discussion

The events described above illustrate that plastic or fibrous material brought inside containment may become a concern after a design basis accident. In general, the material met the plant guidelines for material allowed inside containment and was intentionally brought inside the containment to reduce the spread of loose contamination, identify plant equipment, or for cleaning purposes. The materials involved and the actions taken by the licensees are further described as follows:

Palisades

Palisades employs a pressurized-water reactor with a large dry containment. The licensee evaluated the use of adhesive labels and double-sided tape to affix signs to walls and equipment or piping inside containment. The licensee recognized that the high temperature and humidity that may result from a design basis accident could loosen or dissolve the adhesive. The licensee concluded that, in a worst case scenario in which all of the material became dislodged and entered the containment sumps, the material would cause blockage of recirculation flow of containment sump water and, thereby, could affect the functioning of safety systems.

The licensee thoroughly cleaned the containment and removed about 9 square meters [100 square feet] of unnecessary signs and adhesives including nonessential vendor labels, duct tape, double-sided tape used to affix signs, "Dymo-tape" labels, and tape used to identify plant equipment. After the cleaning, less than .9 square meter [10 square feet] of material remained. The licensee did an engineering analysis and found that the area of greatest concern extended radially about 1.5 meters [5 feet] from the containment sump downcomer for plastic signs and labels and about 3 meters [10 feet] for duct tape. The licensee plans to develop a checklist for containment cleanliness that addresses sump blockage from signs, labels, and tags affixed by adhesive materials. The licensee will also develop a labeling standard that considers the possibility for sump blockage from materials secured by adhesives.

Grand Gulf

Grand Gulf uses a boiling-water reactor (BWR) with a Mark III containment that has an open suppression pool separated from the drywell by a weir wall. The licensee had formed a task force to inspect for materials inside the containment that could block the emergency core cooling strainers. The task force was concerned that plastic film covering some of the refueling equipment could be dislodged and block the strainers. The licensee removed the plastic film from the dryer/separator strongback and is having a cover fabricated for the strongback that will withstand LOCA conditions. The licensee determined that, because of the location, the plastic film covering the personnel

shielding platform could not be washed into the suppression pool; therefore the plastic film was left in place and securely fastened to the platform. The licensee had previously painted the transparent plastic film to make the film easier to locate.

The task force also considered whether step pads used inside containment could block the strainers. The step pads are used to control contamination at exits from radiological control areas inside containment and are taped to the floor with yellow and magenta duct tape. The licensee does not consider it likely that the step pads would be dislodged during a containment spray actuation; however, to minimize this possibility, the radiation department removed step pads not required for continuing work.

Browns Ferry

Browns Ferry uses a BWR with a Mark I Type containment that consists of a steel drywell and toroidal suppression pool. Divers inspecting inside the Unit 2 torus found pieces of paper towel and tape in the torus and on the strainers. The licensee cleaned the torus and strainers of the paper towel and tape, removing about 1 square meter [11 square feet] of material. The total surface area of the four strainers is 3.7 square meters [40 square feet]. If all of the material had become deposited on the strainers it would have blocked about 25 percent of the strainer surface area. From videotape, about 15 percent of one of the two strainers examined was actually blocked under normal operating and test conditions. The licensee calculated that the strainers could be blocked up to 65 percent and still allow adequate core cooling flow.

The licensee determined that material may enter the torus through any of three ways: (1) personnel accessways, (2) vacuum breaker vents, or (3) the torus downcomer vents inside containment. The licensee plans to place covers over the vacuum breaker vents and the torus downcomer vents during maintenance activities in those areas. Regarding the personnel accessways, the licensee reviewed the foreign material control data from the last outage and found weaknesses in the process. For example, an entry in the material control log specified that a bag of towels was brought into the torus area but did not specify the quantity of towels taken in or removed. The licensee issued a site bulletin to alert plant personnel to the need to carefully implement material control procedures and is reviewing the foreign material exclusion procedures for revision.

Related Generic Communications

In NRC Bulletin 93-02 and Supplement 1, "Debris Plugging of Emergency Core Cooling Suction Strainers," the staff discussed the potential for containment sump screens and emergency core cooling strainers to become blocked by fibrous material from piping insulation or air filters. The staff requested licensees to identify sources of fibrous materials and to take immediate compensatory actions to ensure the functional capabilities of affected safety systems. In NRC Information Notice 93-34 and Supplement 1, "Potential for Loss of Emergency Cooling Function Due to a Combination of Operational and Post-LOCA Debris in Containment," the NRC staff discussed the problem of emergency core

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Office of Nuclear Reactor Regulation

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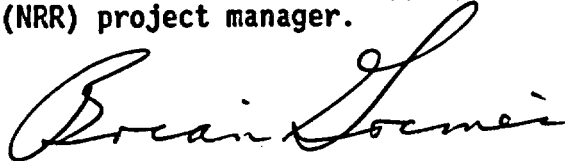
TECH ED	OECD:DOPS	OECD:DOPS	OECD:DOPS	C/OECD:DOPS	D/DOPS:NRR
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cooling systems becoming blocked by a combination of operational and postaccident debris including paint flakes, dirt and corrosion products, and fibrous material from any source. In NRC Information Notice 94-57, "Debris in Containment and the Residual Heat Removal System," the staff discussed additional examples of debris blockage of emergency core cooling systems. These communications highlighted the need to consider dirt and debris and fibrous material as sources of material capable of blocking containment sump screens or emergency core cooling strainers.

This information notice discusses the potential for materials such as tape, labels, plastic film, and paper or cloth products intentionally brought inside containment to collect on screens and strainers and block core cooling systems.

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List of Recently Issued NRC Information Notices

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LIST OF RECENTLY ISSUED
NRC INFORMATION NOTICES

Information Notice No.	Subject	Date of Issuance	Issued to
95-05	Undervoltage Protection Relay Settings Out of Tolerance Due to Test Equipment Harmonics	01/20/95	All holders of Construction Permits for nuclear power reactors.
95-04	Excessive Cooldown and Depressurization of the Reactor Coolant System Following a Loss of Offsite Power	01/19/95	All holders of OLs or CPs for nuclear power reactors.
95-03	Loss of Reactor Coolant Inventory and Potential Loss of Emergency Mitigation Functions While in a Shutdown Condition	01/18/95	All holders of OLs or CPs for nuclear power reactors.
95-02	Problems with General Electric CR2940 Contact Blocks in Medium-Voltage Circuit Breakers	01/17/95	All holders of OLs or CPs for nuclear power reactors.
95-01	DOT Safety Advisory: High Pressure Aluminum Seamless and Aluminum Composite Hoop-Wrapped Cylinders	01/04/95	All U.S. Nuclear Regulatory Commission licensees.
94-90	Transient Resulting in a Reactor Trip and Multiple Safety Injection System Actuations at Salem	12/30/94	All holders of OLs or CPs for nuclear power reactors.
94-89	Equipment Failures at Irradiator Facilities	12/28/94	All U.S. Nuclear Regulatory Commission irradiator licensees.
94-88	Inservice Inspection Deficiencies Result in Severely Degraded Steam Generator Tubes	12/23/94	All holders of OLs or CPs for pressurized water reactors.

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OFFICE	ADM:PUB	OECB:DOPS	SC/OECB:DOPS	OECB:DOPS
NAME	JMain*	JBirmingham*	RDennig*	RKiessel*
DATE	12/05/94	12/05/94	12/22/94	12/22/94
OFFICE	C/OECB:DOPS	D/DOPS		
NAME	AChaffee*	BGrimes		
DATE	12/27/94	01/19/95		

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*note: Dave Skeen was
inadvertently omitted
on concurrence page;
however, he concurred
on original document*

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